Geodata Archive and Sample Repository for the NUSL

Presenters:

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Synopsis: A comprehensive database of subsurface geological information is fundamental to the safe operation and systematic development of the NUSL. In addition to supporting the underground experiments, such a database would be vital to basic geoscience research and to public outreach activities. At its core, the proposed Geodata Archive and Sample Repository would feature a sophisticated 3-D subsurface model integrating all geological, structural, rock mechanics, chemical, and related information. Linked to the virtual model would be physical storage of all available drill core, rock samples, and petrographic thin sections. Establishment of the proposed archive should proceed quickly in order to preserve the integrity of the digital and physical resources during the transition period involving Homestake, Barrick and the NSF.

Discussion on this and related topics is welcomed.

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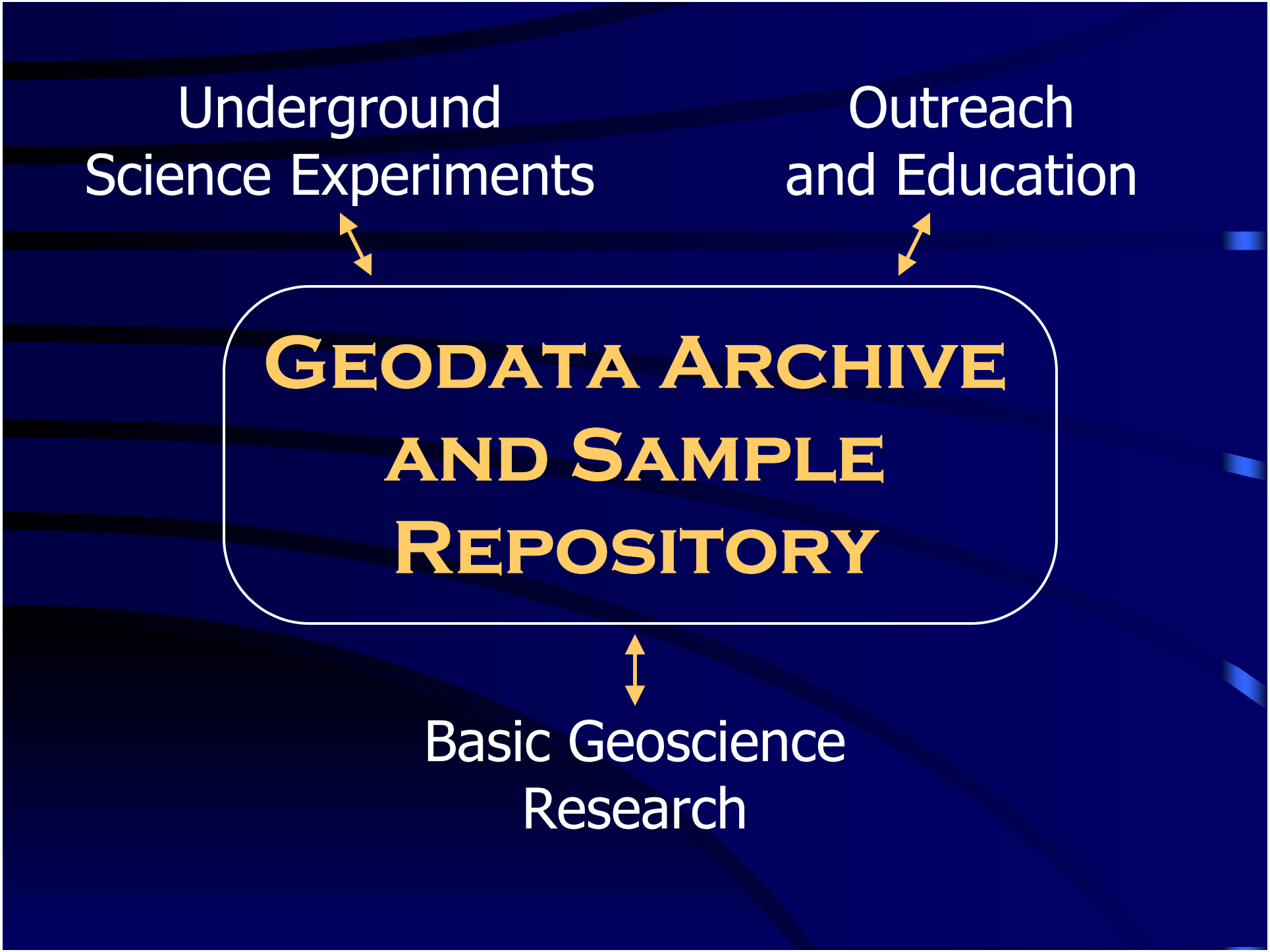

Underground
Science Experiments
Outreach
and Education
Geodata Archive
and Sample
Repository
Basic Geoscience
Research

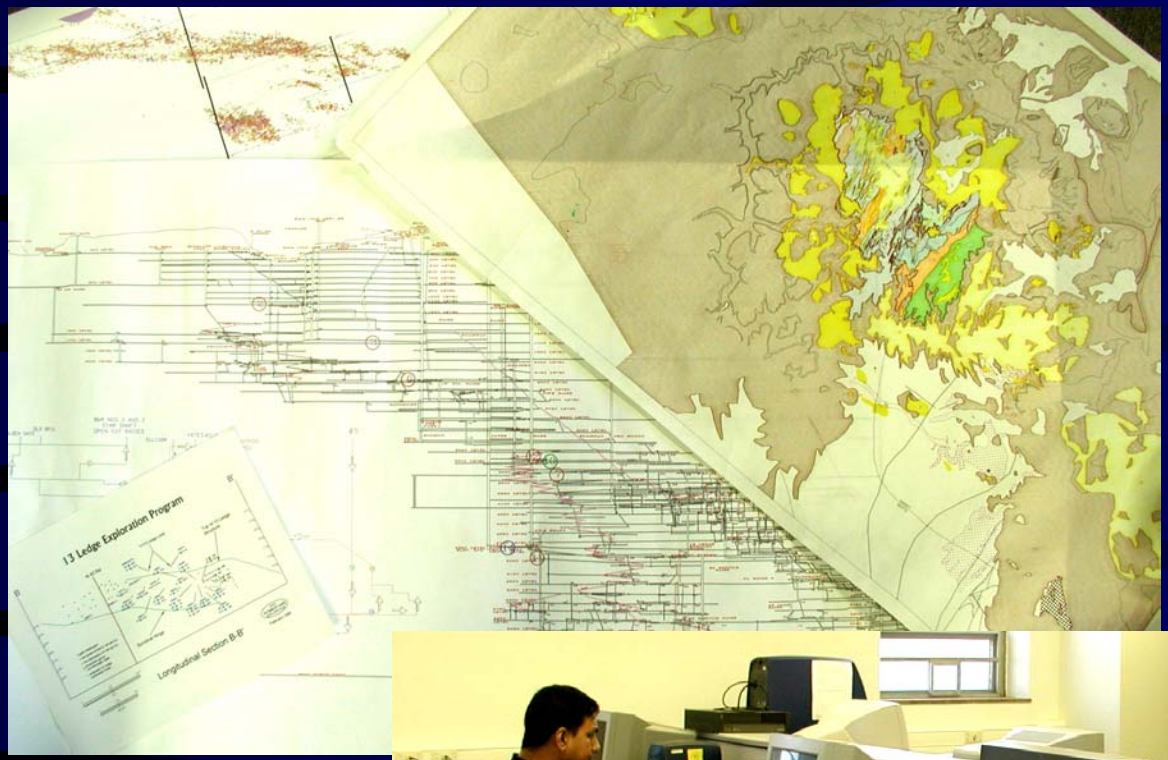
Purpose

Maintain geoscience and engineering data and samples critical to the functions the NUSL.

- Provide data and technical support services for engineering and scientific needs of planned and future experiments at the NUSL.
- Provide data, exhibit materials, and support for educational outreach through the visitors' center, visiting scientits, and student groups.
- Coordinate, support, and perform basic geoscience research that will directly and indirectly aid the NUSL.

Data Available from Homestake

- Vulcan database providing a complete 3D rendering of mine workings, geologic data for 26,000+ diamond drill holes, geologic plan maps and cross-sections.
- 36,000+ maps and sections of the Homestake mine and the Black Hills.


13 Ledge Exploration Program
Longitudinal Section B-B'

Materials Available from Homestake

- Tens of thousands of feet of diamond drill core from documented locations in the mine and the northern Black Hills.
- An extensive reference and display collection of various ores and rock types from the mine and northern Black Hills.

Immediate Action (2002)

- Establish integrity and continuity of digital 3D database, determine interim location for facility and identify staff.
- Secure current core storage facilities along with inventories and core logs pending permanent storage plans.

Next Steps (2002-2003)

- Establish permanent GASR facilities on NUSL site or in Lead.
- Initiate cooperative efforts (internal, external) to define end user requirements.
- Define the priorities for new geoscience research and coordinate among scientists and potential sponsors.

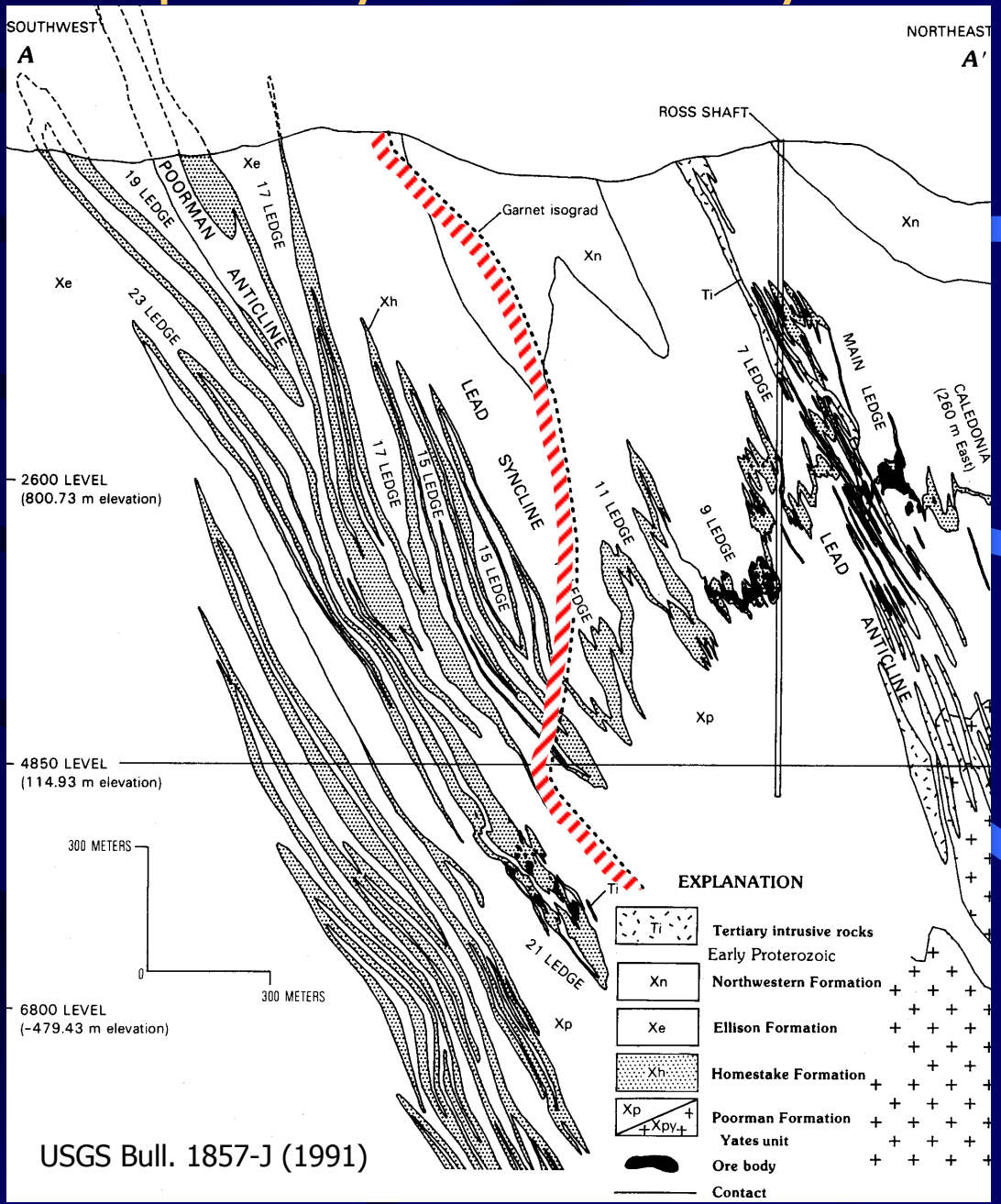
Geoscience Research

- Technical service through on going underground mapping and site characterization.
  - Fractures and joints
  - New drilling and mapping on 7400’ level and elsewhere.
- Basic geoscience research
  - Petrology and geochemistry opportunities

Giant Proterozoic Metamorphic-Hydrothermal System

Research Opportunities:

- Unique 3-D "field area" (>40 km^3)
- Unprecedented vertical sampling (>1 kbar)
- Steep metamorphic gradient and ~vertical isograds
- Giant hydrothermal quartz-vein system
- World-class gold ore body
- Interplay of syngenetic and epigenetic mineralization processes

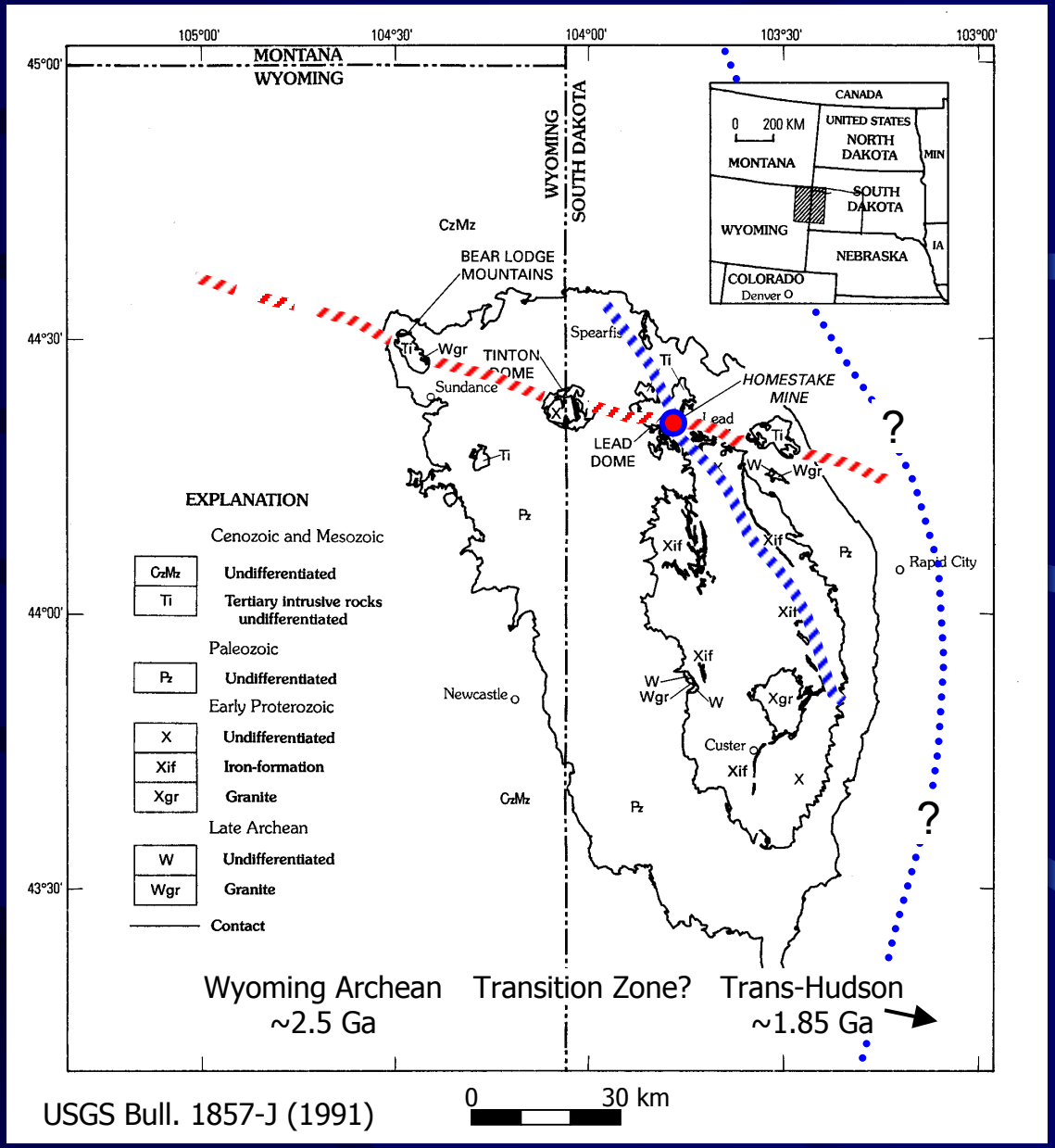


USGS Bull. 1857-J (1991)

Regional Tectonics

Research Opportunities:

- Transition zone between Wyoming Archean Province and Trans-Hudson Orogenic Belt
- Intersection of major basement discontinuities -- active E. Proterozoic(?) through Tertiary
- Boundary between Tertiaty alkalic and subalkalic magmatism



USGS Bull. 1857-J (1991)

Giant Proterozoic Metamorphic-Hydrothermal System

Research Objectives:

- Characterize tectonic and depositional environment including nature of unique chemical sedimentary rocks
- Better age constraints on sedimentation, metamorphism, hydrothermal system and gold mineralization
- Refine metamorphic *P-T*-time model
- Characterize sources of fluids and metals, and fluid/rock interactions
- Involvement of granitic fluids and/or heat source
- Structural controls

Research Methods:

- Stable isotope geochemistry
- Radiogenic isotope dating and tracer studies
- Major and trace element geochemistry
- Fluid inclusion microthermometry, chemistry, and isotopic composition
- Metamorphic phase equilibria and thermobarometry

Summary

- GASR critical to development of the NUSL.
- It provides the geoscience community a unique opportunity to participate in NUSL.
- Planning should proceed ASAP (other research contingent upon this).
- Who, where, how, and $$$ TBD.